ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINNERING & SCIENCE
INDUSTRIAL ENGINEERING DEPARTMENT
COURSE DESCRIPTION AND APPLICATION INFORMATION

Course Name	Code	Semester	T+P Hour	Credit	ECTS
Heuristics in Optimization	IE 517	Fall-Spring	3 + 0	3	10

Prerequisite Courses	There is no prerequisite. Proficiency at least one programming language (C, C++, C#, Java, MATLAB, Python, etc.) is recommended

Course Type	Elective
Course Language	English
Course Coordinator	Asst. Prof. Selçuk Gören
Course Instructor	Asst. Prof. Selçuk Gören
Course Assistant	
Course Objective	Introduce and classify heuristic algorithms used in solving various optimization problems and comparing different heuristics algorithms with each other
Course Learning Outcomes	A student who successfully completes this course 1. defines the class of computational complexity of a problem, 2. calculates upper bounds on the run times of algorithms, 3. classifies basic heuristic algorithms, 4. classifies metaheuristic algorithms, compares them with each other, 5. develops heuristic methods for optimization problems, 6. can apply developed methods to solve optimization problems.
Course Content	Classes of computational complexity of problems, Algorithmic complexity, Basic heuristic structure, Metaheuristics, Comparisons of the heuristics in terms of computational time requirements and performances.

WEEKLY SUBJECTS AND RELATED PRELIMINARY PREPARATION PAGES

Week	Subjects	Preliminary
1	Problem classification in terms of computational complexity	
2	Problem reductions	
3	Algorithm solution times	
4	Basic heuristics - greedy, constructive, improving heuristics	
5	Steepest descent/ascent algorithm	
6	Local search, neighborhoods	
7	Midterm, Project interim report and presentation	
8	An overview of Metaheuristics	
9	Simulated Annealing	
10	Tabu search	
11	Nature-inspired metaheuristics - evolutionary and genetic algorithms	
12	Swarm intelligence - ant colony	
13	Swarm intelligence – particle swarm	
14	GRASP	
15	Project presentations	
16	Final exam	

SOURCES

Lecture Notes	Lecture notes and slides of the course will be shared with students during the semester via CANVAS system.
Other Sources	**Textbook:** El-Ghazali Talbi. *Metaheuristics: From Design to Implementation*. Wiley, 2009. Source Book: Michalewicz, Zbigniew, Fogel, David B. *How to Solve It: Modern Heuristics.* Springer, 2004. Articles

MATERIAL SHARING	
Documents	will be shared with students during the semester via CANVAS system.
Homework	will be shared with students during the semester via CANVAS system.
Exams	1 (one) midterm exam and 1 (one) final exam. 2 exams in total

EVALUATION SYSTEM		
SEMESTER STUDIES	**NUMBER**	**WEIGHT**
Midterm	1	%20
Quiz	5	%15
Homework	5	%15
Project	1	%20
Final Exam	1	%30
TOTAL		%100
Term Activities Percentage		%70
Final Exam Percentage		%30
TOTAL		%100

Course Category	
Natural Sciences and Mathematics	%10
Engineering Sciences	%90
Social Sciences	%0

LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS RELATIONSHIP							
No	Program Qualification	Contribution Level					
		1	2	3	4	5	
1	PQ1.					X	
2	PQ2.				X		
3	PQ3.		X				
4	PQ4.			X			
5	PQ5.				X		
6	PQ6.			X			

* Increasing from 1 to 5.

ECTS / WORK LOAD TABLE			
Activities	Activitiy	Duration (Hour)	Totoal Work Load
Course Duration (including exam week: 16x total course hours)		3	48
Out-of-class Study Time (Pre-study, practice)		4	64
Reading		1	16
Internet browsing, library work		1	10
Project		5	50
Report Preparation		15	30
Presentation Preparation		5	5
Presentation		2	4
Homework		5	25
Quiz		0,2	1
Midterm Exam		20	20
Final Exam		30	30
Total Work Load			303
Total Work Load / 30			10.1
Course ECTS CREDİT			10